

Appendix A

Marked-Up Version of Specification and Claims in U.S. Patent Application No.

09/620,162

In the Specification¹

Page 3, line 25, change “complex” to - - complex - -.

The high rate deposition techniques, which have been used successfully for multicomponent oxide thin films are pulsed laser ablation deposition (PLD) and chemical vapor deposition (CVD). The use of PLD for Ca doped LaMnO₃ (LCMO) has been investigated and the quality of films produced was acceptable. However, as the deposition area is scaled in PLD, one loses the inherent deposition rate advantage. Area scaling is important in making manganate layers because, although device and chip dimensions are small, cost-effective deposition in an integrated process is ideally accomplished at wafer scale dimensions. Further, magnetic sensors and random access memories require thin-film application over complex topographical features (i.e., in multi-layered devices).

Page 8, line 6, change “T_cs” to - - T_c - -.

The shift in the transition temperature for an A site deficient (La+Ca):Mn film of these empirical tests is exemplified by the data shown in Figure 1. This same film was examined in high magnetic fields as shown in Figure 2. The film had a (La+Ca):Mn ratio of 0.73 and a measured T_c of 317°-K after thermal annealing in oxygen. Similar results were obtained for films deposited under identical conditions, but with varying film stoichiometries. The films with a stoichiometry of La_{0.66}Ca_{0.33}MnO₃ exhibited a T_c of 251 K, in agreement with the literature. However, when the (La+Ca):Mn ratio was reduced, the "as-deposited" films exhibited T_c values as high as 295 K. These same films all exhibited increased T_c values after thermal annealing in oxygen. These results point towards the possibility of a hole dependence in the conduction mechanism. If conduction were only dependent on the Mn⁺³/Mn⁺⁴ ratio, then higher T_c values could have been achieved in the La_{0.66}Ca_{0.33}MnO₃ system, since the ratio can be varied by oxygen content, but this was not observed. Consistent with this hypothesis, other empirical work relating to the present invention demonstrates that the variance in (La+Ca):Mn ratio has a greater influence on the observed T_c than does the La:Ca ratio.

¹ Applicants have provided a marked-up version of the amended specification and claims in Appendix A, and a clean set of all pending claims, amended to date, is included in Appendix B

In the Claims

Claims 1-22, are amended as follows:

1. (amended) A method of forming a doped A site deficient **[thin film]** manganate material on a substrate from corresponding precursor(s), comprising liquid delivery and flash vaporization thereof to yield a precursor vapor, and transporting the precursor vapor to a chemical vapor deposition reactor for chemical vapor deposition formation of the **[thin film]** manganate material on the substrate, **said manganate material having a formula of $\text{La}_x\text{M}_y\text{MnO}_3$, where $\text{M} = \text{Mg, Ca, Sr, or Ba}$, and $0.5 < (x+y) < 0.9$.**
2. (amended) **[A] The** method according to claim 1, wherein the precursor(s) comprise coordination compounds, or Lewis base complexes of **[the same, of]** metal(s) selected from the group consisting of lanthanum, magnesium, calcium, strontium, barium, and manganese.
3. (amended) **[A] The** method according to claim 1, wherein the precursor(s) include metal β -diketonate compounds, metal pivalate compounds, or Lewis base complexes thereof.
4. (amended) **[A] The** method according to claim 1, wherein the precursor(s) include metal fluorinated β -diketonate compounds, or Lewis base complexes thereof.
5. (amended) **[A] The** method according to claim 1, wherein the precursor(s) include metal pivalate Lewis base adducts.
6. (amended) **[A] The** method according to claim 1, wherein the **[thin film]** manganate material is selected from the group consisting of **[LaMgMnO, LaCaMnO, LaSrMnO, and LaBaMnO]** **$\text{La}_x\text{Mg}_y\text{MnO}_3$, $\text{La}_x\text{Ca}_y\text{MnO}_3$, $\text{La}_x\text{Sr}_y\text{MnO}_3$, $\text{La}_x\text{Ba}_y\text{MnO}_3$, wherein $0.5 < (x+y) < 0.9$.**

7. (amended) [A] The method according to claim 1, wherein the precursor(s) are dissolved in a solvent and flash vaporized at a temperature of from about 100 °C to about 300 °C.
8. (amended) [A] The method according to claim 1, wherein the precursor vapor is transported to the chemical vapor deposition reactor in a carrier gas.
9. (amended) [A] The method according to claim 8, wherein the carrier gas is selected from the group consisting of argon, nitrogen, neon, helium and ammonia.
10. (amended) [A] The method according to claim 8, wherein the carrier gas is mixed with an oxidizing co-reactant gas in the chemical vapor deposition reactor or prior to transport to the chemical vapor deposition reactor.
11. (amended) [A] The method according to claim 1, wherein the chemical vapor deposition reactor contains a substrate article heated to a temperature in the range of from about 300 °C to about 1000 °C.
12. (amended) [A] The method according to claim 11, wherein the pressure of the precursor vapor in the chemical vapor deposition reactor is from about 0.1 to about 760 Torr.
13. (amended) [A] The method according to claim 1, wherein the chemical vapor deposition is plasma-assisted.
14. (amended) [A] The method according to claim 1, wherein the precursor(s) comprise a mixture of β -diketonate [ligand] compound selected from the group consisting of La(thd)₃, Ca(thd)₂ and Mn(thd)₃.

15. (amended) [A] The method according to claim 1[4], wherein the precursor(s) comprise a mixture of β -diketonate [ligand] compounds selected from the group consisting of $\text{La}(\text{thd})_3$, $\text{Sr}(\text{thd})_2$ and $\text{Mn}(\text{thd})_3$.
16. (amended) [A] The method according to claim 14, wherein said precursor(s) comprise a mixture of Lewis base adducts of metal β -diketonate precursors.
17. (amended) [A] The method according to claim 1, wherein said [thin film] manganate material has A-site deficient stoichiometry, where $(\text{La} + \text{Ca}) < [1.0] \underline{0.9}$.
18. (amended) [A] The method according to claim 1, wherein said [thin film] manganate material has A-site deficient stoichiometry, where $0.5 < (\text{La} + \text{Ca}) < [0.99] \underline{0.9}$.
19. (amended) [A] The method according to claim 1, wherein said [thin film] manganate material has A-site deficient stoichiometry, where $(\text{La} + \text{Sr}) < [1.0] \underline{0.9}$.
20. (amended) [A] The method according to claim 1, wherein said [thin film] manganate material has A-site deficient stoichiometry, where $0.5 < (\text{La} + \text{Sr}) < [0.99] \underline{0.9}$.
21. (amended) [A] The method according to claim 1, wherein said [thin film] manganate material has A-site deficient stoichiometry, where $(\text{La} + \text{Ba}) < [0.99] \underline{0.9}$.
22. (amended) [A] The method according to claim 1, wherein said [thin film] manganate material has A-site deficient stoichiometry, where $0.5 < (\text{La} + \text{Ba}) < [0.99] \underline{0.9}$.

Please add the following new claim:

27. (new) The method according to claim 1, wherein said thin film manganate material has a Curie temperature above 273°K